Nat. Hazard Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2017-328
Influence of uncertain identification of triggering rainfall on the assessment of landslide early warning thresholds, by David J. Peres, A. Cancelliere, R. Greco and T.A. Bogaard.

Reply to Referee #1

We thank the referee for reviewing our manuscript (MS). In the following we answer point by point to his constructive comments. Referee comments are in Times new roman black typesetting, our responses in Arial blue typesetting.

- *The authors*

General Comments

The manuscript of Peres and co-authors entitled "Influence of uncertain identification of triggering rainfall on the assessment of landslide early warning thresholds" is an interesting well-structured and well-written manuscript that addresses a very important scientific question that is within the scope of NHESS. However, it needs some minor revisions prior to be published.

Thanks again for the comments. Please see the following point by point replies.

Specific Comments

1 - The exercise presented along the manuscript is based on synthetic data, which are easier to control and monitor. However, the exercise has the drawback of reporting a single ideal slope. So, there is also a matter of scale when we compare the obtained results with most rainfall thresholds reported in literature that were built to be applied and interpreted at the regional scale. May be this is not enough discussed along the manuscript.

As correctly stated by the reviewer, to refer to synthetic data allows to isolate factors of uncertainty to test their influence on a issue of interest – on ID thresholds in the case of our manuscript.
It is certainly true that mostly thresholds are determined by analyzing rainfall-landslide data from multiple locations within a region. This means that the properties of unstable slopes change from landslide to landslide. Clearly this heterogeneity impacts on the performances of regional thresholds. This is a problem of empirical thresholds, and an additional source of uncertainty. To analyze this source of uncertainty in combination with that related to uncertain knowledge of triggering rainfall events, is out of the scope of our MS, and may be the scope of further research. A comment on this will be added to the text. An outlook in the conclusions mentioning this issue will be added as well.

2 - Within the simulation of uncertainty in triggering instant and the reporting of the landslide, authors establish the 'Observer's day' as lasting from the 6pm of Day D-1 to 6pm of the Day D. The explanation of this option is not clear. Although the reporting of a landslide in newspapers is usually delayed in relation to the actual triggering instant, the information about the timing of triggering may be quite precise namely in those cases where landslide generated severe human and/or economic damages. Apparently, this was not considered in the definition of the 'Observer's day'.

The 'Observer's day' is assumed as lasting from the 6pm of Day *D*-1 to 6pm of the Day *D*. This is justified by normal working hours at day *D*, plus the fact that what happens before in the night is reported in newspapers (and similar sources) from the next morning. The choice of 6pm rather than another hour is quite arbitrary, but a different choice would not affect significantly our results. A small discussion on this will be added to the revised MS.

We agree with the referee that in real datasets there may be a portion of triggering instants known precisely. We preferred to do not consider “mixed scenarios” where small and big errors coexist in certain proportions. It may not be difficult to add those scenarios, but we believe that this would not add substantial changes to the conclusions of the manuscript, or even result in less clear findings. Mixed scenarios would produce impacts that are intermediate between two/three of the considered RS, depending on their percentage.

On this point we also refer to the reply to comment 5 of referee #2.

3 - Quite interesting, figures 6 a), 6 b) and 7 c) are very similar. Comparing figure 6a) and 6b) one can conclude that working at the daily scale the knowledge of exact timing of the landslide triggering is not essential, providing the reporting Day (D) is correct. In addition, when the daily rainfall depth is measured form 09:00 AM to 09:00AM it is clear that most of the rain that falls in the day D will be registered in the day D+1. Therefore, it is normal that threshold (c) corresponding to Scenario RS2 (Day D+1) in figure 7 is virtual similar to the Scenario RS1 (Day D) and RS0 (actual triggering instant) in figure 6. In the opinion of the reviewer, this topic should de discussed more in detail in the paper.

We agree with the reviewer about the comparison of Fig. 6a with Fig. 6b. Stronger comments will be added to the MS following the suggestion of the referee, though the point of the reviewer is already stated in the MS at two points: P6 L17-18; P8L17-18.
Relatively to comparison between Fig. 7c and Fig. 6b, we agree with the reviewer that there is a compensation of errors in this case, as already commented in the MS P7 L3-4. In the conclusions there it is also mentioned that this implicates that the analyzer should check if the original data are affected by this systematic error, and eventually compensate for it (P8 L29-30): “the data analyst has to be aware of possible shifts/delays in the rainfall accumulation interval”
However a more explicit suggestion for the “analyzer” to check and correct for this error will be added.

4 - Although this information is contained on Figures 8 and 9, the equations of thresholds could be provided in a summary table, allowing for a more easy comparison.

In the revised MS, Figures 8 and 9 will be replaced by Tables with the same information.

5 - When performing the exercise for the daily scale that is summarized in figure 6 and 7, a contradiction exists, between figures and text (page 6 line 35) on the assumed Smin. In figure caption it is referred Smin = 0 mm whereas in text is referred Smin = 5 mm.

The actual adopted value is S_{min} = 0 mm. This will be corrected in the revised MS

6 - In figure 10 authors present the “correct thresholds”. However, it is not given the information on the considered Umin and Smin parameters.

The actual adopted value is S_{min} = 0.2 mm and U_{min} = 24 h for the correct thresholds determined from hourly data, and S_{min} = 0 mm and U_{min} = 1 day for those determined from daily data. This will be specified in the caption of the figure.

Technical corrections

In figure 2, the time scale should be respected. The position of 6pm in Day D and Day D-1 is not correctly scaled. Add the notation RS0 in figure 2.

This will be fixed for the revised MS

Figure 3 The aggregation of data within figure 3 should be clearer. Rain gauge D+1appear two times; why? The total amount of rain measured on calendar days and raingauge days is not the same. Authors should acknowledge this difference and explain why.

This will be fixed. Improved figure and a more detailed caption will appear in the revised MS

Table 3 Some rainfall event identification instead of Some event identification.

This will be fixed for the revised MS

Reference of the paper of Nikolopoulos et al needs to be corrected in reference list.

This will be fixed for the revised MS

Page 2. Line 26 Rodriguez-Iturbe et al., 1987a, 1987b instead of Rodriguez-Iturbe et al., 1987; Rodríguez-Iturbe et al., 1987. Introduced a and b in the reference list.

This will be fixed for the revised MS

Page 2, line 31 Baum and Godt, 2010, instead of Baum et al., 2010 ?

This will be fixed for the revised MS. Correct is Baum et al., 2010. Mistake is in reference (third author missing)

Page 3. Line 7 Schilirò et al., 2015a, 2015b, 2016; instead of Schilirò et al., 2015,2016; Schilirò et al., 2015;

This will be fixed for the revised MS

Page 3, line 38 Guzzetti et al 1997, 1998 are missing in reference list.

This will be fixed for the revised MS